by ambulance. The blood sugar on entry was 45 milligrams per cent. The brain was preserved for special study and the report is not yet available. There were no other definite findings at autopsy to explain the cause of death. It must be admitted that this death might just as well have been caused by the unmodified insulin if used in the same careless manner.

While this new preparation offers certain distinct advantages in the treatment of diabetes, much remains to be learned regarding its effects and its indications. Many patients may do equally well or even better with the old insulin. Experience has demonstrated that it must be used with great care.

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H. CLARE SHEPARDSON, M. D. (384 Post Street, San Francisco).—Confidence in the effects of a new therapeutic agent is attained only after proper evaluation of the experiences of various investigators who have made exhaustive studies concerning the detailed actions of such an agent. Consequently, due cognizance should be taken of each article covering the use of protamin-zinc insulin.

Doctor Sherrill has given a concise report of his results with this material. Thorough analysis indicates his experiences parallel those of other workers, with certain rather minor exceptions.

At the University of California Out-Patient Department we have found a much greater benefit accruing to the severe diabetic, who by the use of long acting insulin is maintained under better control, than was possible using regular insulin. In our group of severe diabetics we have been able to reduce the daily dosage (units of insulin per day) of insulin 30 per cent, and the number of daily injections to two daily. Furthermore, the number of uncontrolled cases has been reduced 50 per cent. In no instance has it been necessary to give more than two injections of protamin-zinc insulin daily, and usually one dose of protamin-zinc insulin and one of regular insulin suffices to control the moderate-to-severe diabetic. This is the patient who formerly had to subject himself to oft-repeated injections of regular insulin to insure reasonable control of the disease.

We were unable to observe any essential change in the insulin dosage or degree of control in patients with mild diabetes, but it was possible, in this group, to reduce the number of daily injections by one-half, with the large majority taking only one injection daily. Also no appreciable lowering of the total daily dosage was possible in the group with moderately severe diabetes, but there was a reduction of 26 per cent in the number of daily injections. And the number of uncontrolled cases in this group was reduced to 25 per cent of the previous number.

There are many factors, of course, which influence the results obtained in various clinics. Thus the manner in which patients follow a prescribed routine, and the attention given in the explanation of details in therapy to the patient, can account for rather wide variations in the results obtained. It is our belief, however, that protamin-zinc insulin represents a decided step forward in diabetic therapeutics, and that the benefits obtained are in direct proportion to the severity of the diabetes.

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F. M. POTTENGER, JR., M. D. (Pottenger Sanitarium, Monrovia).—Although protamin insulin apparently possesses certain drawbacks, I wish to speak of a class of patients who have both severe diabetes and tuberculosis, and who require not the 10 to 20 units of insulin a day, spoken of by Doctor Sherrill, but from 80 to 100 units and even 150 units or more to control their diabetes. In such patients we have been able to reduce the number of injections from 4 or 5, to 1 or 2 in twenty-four hours. We have also experienced a much better control of our diabetics than we formerly had. This particularly applies to the exacerbations of the diabetes which follow the exacerbations in tuberculosis so commonly experienced by these patients. Some of these patients using the ordinary insulin have been prone to have extremely high early morning, and extremely low afternoon blood sugars. A satisfactory control of these cases is very difficult to obtain; but by substituting protamin insulin for the ordinary insulin, exacerbations, both tuberculous and diabetic, tend to be less severe and more easily controlled. Protamin insulin apparently gives these patients a better tone to their heart muscles, as evidenced by the almost universal drop in the pulse of 10 to 20 beats.

In spite of the great advantages, however, there are some drawbacks which complicate the administration of protamin insulin. In one instance we have seen insulin remain in the tissues and form nodules; then, all of a sudden, the insulin was released, causing a prolonged hypoglycemia.

CREATINURIA OF CHILDHOOD*

WITH SPECIAL REFERENCE TO BONE AGE

By E. KOST SHELTON, M.D.
AND
B. N. TAGER, M.D.
Los Angeles

DISCUSSION *by H. Lisser, M. D., San Francisco; Howard L. Eder, M. D., Santa Barbara; Willard E. Kay, M. D., San Francisco.*

CREATINURIA is normally present in childhood.[1] The absence of this phenomenon in cretinism and in childhood myxedema has recently been reported.[2,3] In such children the administration of thyroid causes a prompt appearance of creatin in the urine. Injection of the thyrotropic fraction of the anterior pituitary into animals with intact thyroid glands also enhances creatin excretion.[4] These observations are consistent with the augmentation of urinary creatin in adult hyperthyroidism, and of its diminution or suppression following restriction of thyroid function.[5,6]

Retardation of bone development in cretinism and in childhood myxedema is a well-established fact and one of proved value in differentiating such severe subthyroid states from other forms of mental defectiveness, mongolism, etc. In the less classical forms of hypothyroidism, marked retardation of bone development offers a valuable aid in diagnosis.[7,8] The response of these children to thyroid administration is too remarkable to be anything but specific. There remains a third and larger group, with moderately retarded bone age, who, although suffering from some disturbance of somatic development, present difficulties in diagnosis. The possibility of a borderline subthyroid state in a percentage of these children cannot always be excluded. However, other hormone influences, as well as nutritional, infectious, congenital or constitutional factors, undoubtedly contribute to the formation of this group. The present study was designed to throw more light on the indeterminate case.

DIVISION OF THE STUDY

The study was divided into two main parts:

1. An estimation of creatin excretion on admission in (*a*) clinically verified hypothyroid children with markedly retarded bone age; (*b*) in children with moderately retarded bone age in whom the thyroid status was unknown; (*c*) in children with normal bone development.

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* From the Shelton Clinic, Los Angeles.

Read before the Pediatric Section of the California Medical Association at the sixty-sixth annual session, Del Monte, May 2–6, 1937.

The expense of this investigation was defrayed by a fellowship from the St. Francis Foundation for Clinical Research, Santa Barbara.

TABLE 1.—*Averages of Duplicate Analysis of Creatin on Each of Two Successive Days*

Name	V. L.	A. C.	A. S.	H. J.	P. M.
First day	330 ±24	54 ± 9	142 ±36	16 ±12	150 ±10
Second day	193 ±20	118 ±40	57 ±30	20 ±30	70 ±30

2. An estimation of creatin excretion on admission, as compared with the creatin excretion following certain therapeutic regimens. In this last study the children were selected at random—that is, without reference to thyroid status or bone age. The therapeutic regimens were as follows: (*a*) Ten children were given U. S. P. desiccated thyroid † (uncoated) one-half grain daily, for three months. (*b*) Ten children were given Lugol's Solution, ten drops twice daily, for two weeks. (*c*) Eighteen children were given cod-liver oil and iron (one dram twice daily, total iron content, seven grains). (*d*) Nineteen children were given no medication, but received the basic well-balanced diet, sunshine, rest, and good nursing care common to all. The difference between admission and final creatinuria in the last group served as a control.

CLINICAL MATERIAL FOR THE STUDY

Studies were undertaken on fifty-six children between the ages of six and thirteen, all but four of whom were admitted to a preventorium during the past year for the purposes of physical betterment. The reasons for admission to the preventorium consisted of one or more of the following complaints: (1) Underweight. (2) Poor resistance to respiratory infections. (3) Contact with tuberculosis. Acute illness or active chronic illness was present in no instance. There were twenty-seven boys and twenty-nine girls. Bone age was unknown prior to admission, but was determined roentgenographically on entry, using the status of the carpal and elbow development as criteria. Bone retardation as here defined implies a delay in osseous development of two years or more, as compared with chronological age, according to the standards at our command.[9] The general agreement, in reading the roentgenograms (within one year) between the two most experienced observers, was gratifying.

All children were under observation for at least three months. A complete physical examination, blood count, urinalysis, Wassermann and tuberculin test were performed on entrance. Pulse and temperature readings were periodically recorded, and the presence of even a minor infection was considered an indication to postpone the collection of urine for study. Excellent nursing supervision was provided, assuring the complete collection of urine and the maintenance of standard environmental conditions. During periods of collection the children were restricted to bed rest, but were permitted to sit up in bed and play. A meat-free diet was maintained, although eggs and milk were permitted. In every instance, a preliminary day on the above regimen was observed before the urine collection was initiated.

† Supplied through the courtesy of Armour & Company.

METHOD

Creatin was determined by the method of Folin [10] and values expressed in terms of milligrams equivalent of creatinin excreted in twenty-four hours. Determinations were made at first in duplicate, but this practice was discontinued when it became evident that fluctuations from day to day appeared to exceed variations in duplicates of a single day. (See Tables 1 and 2). When more than one determination was made within a two-week period, the values were averaged and the single figure recorded in tables 3, 4 and 5. Two hundred determinations were made in all. The urine was also routinely examined microscopically and for sugar. A known solution of creatin (one gram per liter) was made and determined concomitantly with the unknowns to serve as a control on the accuracy of technique. In calculating the averages, probable error, and the significance of the deviation between the two averages, standard statistical methods were employed.[11,12]

RESULTS

Table 3 presents creatin values obtained on admission and following the various regimens, on all of the fifty-six children. Those presenting bone retardation, as here defined, are marked thus (*). Clinically verified hypothyroid cases (all of whom had severely retarded bone age) are marked thus (†). The sex is denoted. The ages between six and thirteen are fairly evenly distributed, but are not denoted because the number in each group is insufficient to be conclusive as regards the influence of the age factor. In both the normal children and those manifesting bone retardation, however, an increased creatinuria, with increase in age up to puberty, is suspected.

Table 4 presents the averages (values of urinary creatin on admission only) of each of the three groups in the first study, *i. e.*, those with clinically verified hypothyroidism and markedly retarded bone age; those with retarded bone development, whose thyroid status is unknown; and those considered normal as regards bone age. While sex was ultimately discovered to have little effect on the

TABLE 2.—*Fluctuation of Creatin Determined in Singles on Five Successive Days*

Name	First	Second	Third	Fourth	Fifth
T. S.	206	156	258	243	372
R. S.	214	212	150	107	68
N. C.	240	317	259	367	240
V. D.	226	199	230	147	149
J. R.	65	265	139	264	292

TABLE 3.—*Creatin Excretion on Admission and Following Therapy*

Name	Sex	Bone Age	Creatin on Admission	After Three Months No Medication	Name	Sex	Bone Age	Creatin on Admission	After Three Months Cod Liver Oil	Name	Sex	Bone Age	Creatin on Admission	After Three Months Thyroid	After Two Weeks Lugols
B. K.	M.		390	115	D. U.	M.		99	208	D. V.	M.		45	128	
B. C.	M.		208	150	B. A.	M.		60	138	G. T.	M.	*	165	117	
E. T.	M.	†	76	312	B. R.	M.	*	288	242	F. S.	M.	*	130	23	
F. G.	M.	*	109	230	R. B.	M.	*	187	140	J. P.	M.	*	218	14	
J. R.	M.	*	80	256	I. P.	M.	*	252	175	J. S.	F.	†	81	182	
E. G.	M.		160	114	J. R.	M.		325	76	R. O.	F.	†	76	145	
H. F.	M.	*	305	418	E. G.	M.	*	137	171	R. D.	M.	†	78	146	
E. D.	F.		321	378	L. R.	F.		45	210	H. J.	F.	†	22	82	
M. M.	F.		70	200	E. W.	F.		60	180	E. S.	F.		80	174	
M. K.	F.		67	280	T. S.	F.		170	210	M. M.	F.		70	145	
J. R.	F.		80	256	D. S.	F.		198	164						
E. L.	F.		138	450	D. R.	F.		60	215						
B. P.	F.		120	187	E. L.	F.		294	192						
C. J.	F.		195	165	G. F.	F.		192	308						
G. E.	F.		215	238	M. C.	F.		38	198						
P. B.	F.	*	104	156	R. V.	F.		126	420	B. C.	M.		179		594
M. W.	F.	*	161	232	G. E.	F.		227	72	G. V.	M.		140		76
L. C.	M.	*	235	100	D. B.	F.	*	98	237	E. C.	M.		270		112
E. L.	F.		138	450	C. G.	F.		108		E. S.	F.		80		513
B. N.	M.	†	20		A. M.	F.		210		M. M.	F.		133		105
T. C.	M.		45		E. L.	F.		240		J. R.	F.		168		264
R. R.	M.	*	140		M. P.	F.		115		V. L.	F.		137		374
Q. L.	M.	*	188							D. D.	F.		189		242
A. O.	F.		270							N. P.	F.		324		440
L. F.	F.	*	50							C. J.	F.		180		506

*Moderately retarded bone age.
†Severely retarded bone age (clinically verified hypothyroid).
F. Female.
M. Male.

level of creatin excretion (Table 5), girls, on the whole, excreting a little more than boys, it should be explained that all except the clinically verified hypothyroid children in this (first) study were male. The retarded boys excreted, on the whole, much more creatin than those in the normal or control group, the difference approaching statistical significance. In the verified hypothyroid group, girls were included because of the dearth of material. In spite of the sex trend, as previously stated, the average for this group is considerably below that for the normal, and that for the boys presenting bone retardation. The difference between these averages is statistically significant. In order to obviate confusion, it should be remembered that the clinically hypothyroid children all had severely retarded bone development, but are not here included or considered in the retarded bone-age

TABLE 4.—*Mean of Creatinuria on Admission in Verified Hypothyroid, Normal, and Bone Retarded Children*

Group	Number Cases	Mean	P. E. M.*	Deviation†	Significance‡
Hypothyroid	6	59	± 7	64	3.1
Normal	8	123	±19	70	2.8
Retarded	15	193	±16		

* Probable error of mean.
†Deviation between the two means.
‡Significance of deviation = $\frac{\text{Deviation}}{\text{P. E. of deviation}}$

group. When all of the fifty-two (preventorium) children are considered, the same trend of increased creatin values may be seen by a shift of the curve of the retarded bone-age group to the right (Chart 1).

Table 5 summarizes the effect of therapy on creatinuria or the outcome of the second phase of this study. Some increase in creatin excretion appeared following cod-liver oil and thyroid. The magnitude of this increase is, however, not statistically significant, and falls within the same range as the increase in the control group under excellent hygienic care, but not subjected to medication. Therapy with Lugol's Solution, however, almost doubled the creatin excretion and is statistically significant.

COMMENT

Of fifty-two children (about equally divided as to sex), ranging in ages from six to thirteen, in whom creatin studies were carried out, nineteen (or 36.5 per cent) were found to be retarded two years or more in bone development. This figure is approximately 23 per cent higher than that observed by Shelton in 560 unselected public school children.[8] The difference is perhaps to be expected, since all of the fifty-two children were admitted to the preventorium for correction of underweight and other physical inadequacies. In this group, retardation of bone development was found to be four times more common in boys than in girls. This is in agreement with previous findings.

The finding of an increased creatinuria in children presenting bone retardation suggests that hypothyroidism is not the underlying factor, since in clinically verified hypothyroid children, also presenting bone retardation, diminished creatin excretion is discovered. Nor can one explain the increased creatinuria in the former on the basis that the retarded child is physiologically younger, since from this study the impression is gathered that younger children excrete less creatin than those approaching puberty. The difference apparently depends on a qualitative, rather than a quantitative factor. One may infer that the increased creatinuria, in the presence of bone retardation, is due to an inferior musculature, *i. e.*, a concept applied to muscle dystrophies and borne out by the fact that creatinuria is augmented in hyperthyroidism with increasing muscular weakness.[13-15] This concept may be permissible, since retarded skeletal development implies a poor musculature, and vice versa. Be that as it may, in the presence of a moderate

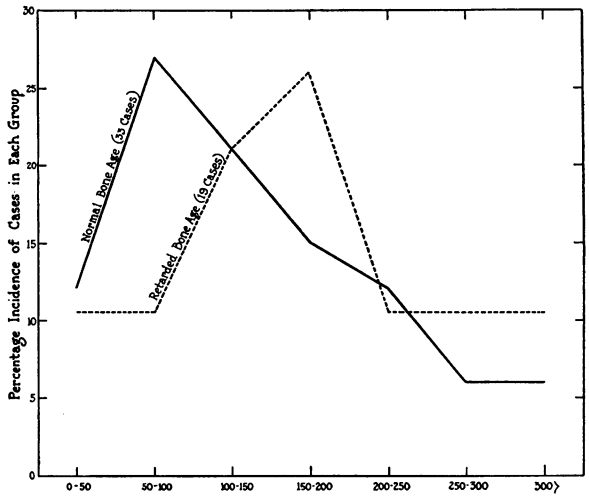

Chart 1.—Creatin excretion, milligrams, in twenty-four hours. Distribution curve of creative values for normal children and for children with retarded bone development.

degree of bone retardation and an indeterminate clinical picture, the finding of a diminished creatin excretion suggests that hypothyroidism may be the causative factor. Under such circumstances a prolonged therapeutic trial with thyroid is indicated. If, in a similar patient, the creatin excretion is discovered to be increased, it may be taken as evidence against the diagnosis of hypothyroidism. In all instances the spontaneous variability in creatin excretion from day to day cannot be stressed too strongly, and a number of creatin determinations on different days is recommended.

In the second part of the study, all forms of therapy led to some increase in creatinuria; yet the response to cod-liver oil and to thyroid appeared no greater than to a well-balanced diet, sunshine, and good nursing care without medication. In view of the observations of others, namely, that thyroid administration to cretin children results promptly in an increase in creatin excretion, the figures here presented may appear at variance. We feel, however, that the studies are not comparable. In the hands of others, thyroid administration led to prompt creatinuria in hypothyroid children. In this study our observations were not made promptly after the administration of thyroid, nor did our group of ten represent exclusively hypothyroid children. The six clinically verified hypothyroid children under observation did show a substan-

TABLE 5.—*Influence of Medication on Creatinuria (Without Reference to Bone Age or Thyroid State)*

Number Cases	Sex	Mean on Admission	No Medicine (Control)	Three Months Cod Liver Oil	Three Months Thyroid	Two Weeks Lugols	Significance
8	Male	123 ±19					
25	Female	148 ±12					1.1
19	Both	181 ±15	218 ±18				1.6
18	Both	165 ±15		199 ±15			1.6
10	Both	97 ±10			116 ±10		1.4
10	Both	180 ±14				327 ±39	3.4

tial increase in creatin excretion following thyroid treatment.

CONCLUSIONS

1. In clinically verified hypothyroid children (all of whom presented severely retarded bone development) the finding of diminished creatinuria is confirmed.

2. In children presenting an indeterminate clinical picture (accompanied by retarded bone development) increased creatinuria was found.

3. Administration of iodin to children (unselected as regards thyroid status or bone development) caused a significant increase in creatinuria.*

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DISCUSSION

H. Lisser, M.D. (384 Post Street, San Francisco).—Efforts to utilize sundry laboratory procedures to render more precise clinical diagnoses of endocrinopathies are commendable and desirable. In this connection it is hoped that researches now in progress, aiming to assay hormones quantitatively in blood or urine, etc., may eventually prove helpful in differential diagnoses of amenorrhea, infantilisms, virilisms, precocity syndromes, hypertensions and disturbances in calcium and carbohydrate metabolism.

Accordingly, Doctor Shelton deserves credit for this painstaking attempt to evaluate the significance of increased or decreased creatin excretion in dubious or borderline instances of childhood retardation. His results seem to indicate that the particular group of problem cases he studied could be excluded from a hypothyroid status by reason of increased rather than decreased creatinuria.

Doubtless, Doctor Shelton would not wish to give the impression that he considers a single laboratory test sufficient to establish a diagnosis; for example, one may encounter a diminished basal metabolic rate occasionally in hyperthyroidism, or a negative Wassermann in active syphilis. Nevertheless, negative or positive laboratory data, together with positive or negative symptoms and signs, constitute the foundations for the building of a diagnosis. Therefore, the more confusing and obscure a case may be the more elaborate the testings required to clarify the muddle.

No doubt others will wish to confirm and extend Doctor Shelton's studies of creatinuria of childhood, and many hundreds of cases must be checked before the true significance will be established. Premature enthusiasm for a new laboratory test must be avoided. Thus, the initial expectations of a reliable distinction between hypo- and hyperthyroidism, by determination of the blood cholesterol, was considerably exaggerated.

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Howard L. Eder, M.D. (Santa Barbara Clinic, Santa Barbara).—This work, as reported by Doctors Shelton and Tager, on creatinuria during childhood is of importance. We find certain children who are obviously not in a state of good nutrition, who show no definite laboratory findings on which to base diagnosis or treatment.

The majority of the cases reported in this paper were such children cared for in a preventorium under controlled conditions extremely suitable for study. This investigation showed that those children with retarded bone ages when given thyroid did not respond by an increase in the creatin output. The children did, however, show a considerable increase when given Lugol solution. We have made it a routine procedure to give all new admissions Lugol solutions. We have not decided whether these children are undernourished as a result of some endocrine disturbance caused by a retardation in osseous development, or whether the osseous retardation is a direct result of prolonged poor nutrition from causes other than endocrine deficiency. We have been able, by carrying out a careful regimen, to obtain an average gain in weight of twelve and one-half pounds per child in a period of four months in the preventorium. We have also followed a high per cent of these children after their discharge and found them to continue to gain weight and remain in a state of good nutrition. All children receive seven grains of iron carbonate in an emulsion of cod-liver oil as long as they remain in the preventorium, and they continue its use after they return to their homes. Many of these children, because of clinical evidence or retardation of osseous development, are put on thyroid medication.

This study, as reported by Doctors Shelton and Tager, has been of value to us. I am sure that the importance of creatin output in this type of child is of more significance than can be stated at this time.

❦

Willard E. Kay, M.D. (2000 Van Ness Avenue, San Francisco).—This contribution of Doctors Shelton and Tager clarifies very considerably the handling and therapeusis of this rather large group of children showing moderate bone retardation. Many of them are undernourished, underdeveloped, susceptible to infection, and are allergic. Frequently, signs and symptoms of hypothyroidism associated with a colloid goiter or thickening of the gland and a hypertonic vegetative nervous system with vagotonia and a slow pulse, etc., confuse the picture. The finding radiographically of retarded bone age fits in well with the clinical impression and wish fulfillment that at last we have found the treatment for these deficient individuals, and so exhibit thyroid extract in every form and dosage over prolonged periods. Its failure to help is not only a great disappointment to ourselves but to the parents who, through our enthusiasm, have become too hopeful. In some instances the children are made worse, become more nervous and irritable, and lose weight. We wonder why we have not obtained better results. Since we know a basal metabolism is unreliable and a blood cholesterol likewise, the latter only revealing the more pronounced hypothyroid states when the determination of the bone age is an easier and more reliable aid in diagnosis, this finding of Doctors

*The authors wish to acknowledge the kindly coöperation of Dr. Howard Eder, Medical Director, Miss Cass, Supervisor, and the staff of Sunshine Cottage, Santa Barbara.

Shelton and Tager now gives us a valuable diagnostic aid and marks a definite advancement in our understanding of these cases.

Only within the past few years has the measurement of creatin in the urine been of much clinical significance endocrinologically. Hess (Hess, J. H., Ann. Int. Med., 8:607, 1934) shows that creatinuria is a very delicate index of the effect of thyroid administration, that there is a diminution or complete absence of physiological creatinuria in hypothyroidism, and that thyroid restores it to the normal content; that creatinuria is restored even before changes in body weight, blood cholesterol and basal metabolism are to be noted. Previously, blood creatin and creatinin and urinary creatinuria were chiefly studied from the standpoint of the myopathies, notably the muscular dystrophies. When Janney and his coworkers, in 1918, found an abnormal presence of creatin in the urine (Janney, N. W., Goodhart, S. P., and Isaacson, V. I., "The Endocrine Origin of Muscular Dystrophy," Arch. Int. Med., 211:188, February, 1918), they then noted a polyglandular involvement in which the thyroid, hypophysis, gonads, pineal, and adrenals participated. In 1921 Brock and I (Brock, S., and Kay, W. E., "A Study of Unusual Endocrine Disturbances," Arch. Int. Med., Vol. 27, pp. 1-37, January, 1921), reported our findings in young adults of service age, of the blood and urine creatin in myopathies associated with unusual endocrine disturbances. We did not find anything significant. Recently, in 1936, P. Kahn and N. Smith (Arch. Dis. Child., 11:307-310, December, 1936) feel from their studies that when the gonads are not properly functioning creatinuria appears. Children have creatinuria until puberty. Further, they state that old people have small amounts of creatin, that eunuchoids have constant creatinuria, and that pituitary obesity and hypogenitalism are accompanied with creatinuria. They go on to show that muscle dystrophy or immature muscle mass does not account for it. I should like to ask Doctors Shelton and Tager whether or not the finding of an increased creatinuria in these children might be significant from their point of view?

ROENTGEN-RAY PELVIMETRY*

A STUDY OF THREE HUNDRED TWENTY LABORS

By CHARLES THOMAS HAYDEN, M.D.
San Francisco

DISCUSSION *by Alice F. Maxwell, M. D., San Francisco; D. G. Morton, M. D., San Francisco; John N. Ewer, M. D., Oakland.*

AT the University of California Hospital, routine roentgen-ray studies have been made on all primiparous women for the past four years.

Three exposures were taken: (1) The diameter and configuration of the superior strait were obtained by the Thoms grid method. (2) A lateral film, with the patient in a standing position so that the femurs were superimposed one upon the other, and the Thoms grid plate again used. (3) The subpubic angle was demonstrated by methods proposed by Pettit, Garland, Dunn, and Shumaker.

CLASSIFICATION OF THE FEMALE PELVIS

These films furnished us with material for study with regard to the pelvis, from the standpoint of actual measurements of the superior strait, and at the same time afforded us an opportunity to study the salient characteristics shown by Caldwell and Moloy in their classification of the female pelvis.

The classification is based upon the following factors:

1. The size of the posterior segment of the superior strait.
2. The size of the anterior segment of the superior strait.
3. The degree of the retropubic angle.
4. The width of the greater sciatic notch.
5. The size and shape of the ischial spines.
6. The lateral bore (relationship of the anterior and posterior surfaces of bony birth canal).
7. The width of the subpubic angle.
8. The splay (relationship of the lateral pelvic walls).

FOUR MAIN TYPES

Upon this basis, the four main types of female pelves are distinguished:

1. In the gynecoid type of pelvis, there is a wide posterior segment to the superior strait, wide anterior segment with obtuse retropubic angle, wide greater sciatic notch, average ischial spines, parallel lateral bore, average or wide subpubic angle, and parallel splay.
2. In the android type, there is a narrow posterior segment to the superior strait, anterior segment with acute retropubic angle, narrow greater sciatic notch, prominent sharp ischial spines, converging lateral bore, narrow subpubic angle, and converging splay.
3. In the anthropoid type, the pelvic inlet is greater in its anteroposterior diameter than its transverse diameter, with a resultant wide posterior segment, an anterior segment which is apt to have a slightly acute retropubic angle, extremely wide greater sciatic notch, blunt ischial spines, a lateral bore which is divergent, average or slightly narrowed subpubic angle (often associated with a deep type of pelvis), and either parallel or slightly convergent splay.
4. In the platypelloid type, the pelvic inlet is shortened in its anteroposterior diameter and lengthened in its transverse diameter with a variation of three centimeters or more. This type has a wide retropubic angle, average greater sciatic notch, average spines, inclined to have a divergent type of bore, average subpubic angle and divergent splay.

There are numerous combinations of the above types which account for the subgroups of the classification, as advocated by Caldwell and Moloy, and which constituted 25 per cent of our cases.

AUTHOR'S GROUPING

In a series of consecutive pelves studied, we found the following groups, which we have compared with the series reported by Caldwell and Moloy (215 cases), and the series of one hundred cases reported by Pettit, Gardland, Dunn, and Shumaker.

It is clearly seen that these figures compare for the most part with only minor variations, which are probably due to the differences in clinical material as observed in cross section of any district or section of the country.

In a recent report by Thoms, it is observed that he also found an incidence of anthropoid pelves,

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